

**Program Announcement
To DOE National Laboratories
LAB 08-16**

***The OFES-NNSA Joint Program in
High Energy Density Laboratory Plasmas***

SUMMARY: The Office of Fusion Energy Sciences (OFES) of the Office of Science (SC) of the Department of Energy (DOE) announces its interest in receiving proposals including renewals of existing awards in FY 2009 for research in energy-related High Energy Density Laboratory Plasmas (HEDLP). This Announcement is directed at researchers who are affiliated with DOE national laboratories and government laboratories. Collaboration with private sector and academic organizations is allowed (details for setting up such collaboration are given in the section Collaboration below). Proposals should clearly indicate in the Title Page and in the Executive Summary the research area or areas (i) - (ii) identified in the section on Research Topics the Proposal is responding to.

A separate compendium Announcement will be released for the OFES-NNSA Joint Program in High Energy Density Laboratory Plasma directed at researchers not affiliated with DOE national laboratories and government laboratories.

LETTER OF INTENT DUE DATE: August 18, 2008

A Letter-of-Intent (LOI) to submit a proposal is REQUIRED and should be submitted by August 18, 2008. Failure to submit a Letter-of-Intent by a proposer may preclude the full proposal from due consideration. Electronic submission of the Letter-of-Intent and the formal proposal in PDF format is required. It is important that the submission be in a single PDF file. The Letter of Intent should clearly indicate the research area or areas (i) - (ii) identified in the section on Research Topics the proposal is responding to. The Letter of Intent should be submitted electronically by E-mail to John.Sauter@science.doe.gov, with a copy to Francis.Thio@science.doe.gov and Allan.Hauer@nnsa.doe.gov. Please include "Letter of Intent for LAB 08-16" in the subject line.

The purpose of the Letter-of-Intent (LOI) is to facilitate the OFES in planning the review and the selection of potential reviewers for the proposal. For this purpose, the LOI must include a one-page abstract of the proposed research, and list the names and institutional affiliations of Principal Investigators, any Co-Principal Investigators, key investigators, collaborators, or consultants, so as to reveal any potential conflict of interest in the selection of reviewers for the proposal. For proposed investigations requiring access to experimental user facilities, confirmation of communication with the facility's point-of- contact should be indicated in the LOI.

FORMAL PROPOSAL DUE DATE: September 11, 2008, 8 PM Eastern Time

DATES: Proposals submitted in response to this Announcement must be submitted using the **Office of Science Field Work Proposal Instructions** provided in the **Notice to Users** section on the ePMA home page: <http://www.osti.gov/fwp>, and must be received no later than **September 11, 2008**, 8:00 p.m., Eastern Time to be accepted for merit review and to permit timely consideration for award.

Please see the "Addresses" section below for further instructions on the method of submission for the proposal.

ADDRESSES: A complete formal FWP in a single Portable Document Format (PDF) document that has 'formatted text and graphics' (also known as "native" PDF) must be submitted using the **Office of Science Field Work Proposal Instructions** provided in the Notice to Users section on the Searchable FWP home page: <http://www.osti.gov/fwp>. (This submission process includes sending the FWP via CD using Federal Express).

Send CD via Federal Express to:

Mr. John Sauter
U.S. Department of Energy
Office of Fusion Energy Sciences, SC-24.2/GTN
19901 Germantown Road
Germantown, MD 20874-1290
ATTN: Program Announcement LAB 08-16

To identify that the FWP is responding to this Program Announcement, when sending your CD please identify the Program Announcement Title and Program Announcement number on the Federal Express package.

In addition to following the submission instructions on the <http://www.osti.gov/fwp> web site, please submit via email, a single PDF file of the entire LAB proposal and FWP. This will assist in expediting the review process. Please send the email to: john.sauter@science.doe.gov. Please include "Proposal for LAB 08-16" in the subject line of the email.

DOE National Laboratories should submit as instructed above. Researchers from other Federal agencies and Non-DOE Federally Funded Research and Development Centers (FFRDCs) should follow the format at http://www.science.doe.gov/grants/fed_prop.html and also submit via email as stated above.

FOR FURTHER INFORMATION CONTACT:

PROGRAM MANAGER: Dr. Francis Thio, Office of Fusion Energy Sciences
PHONE: (301) 903-4678
FAX: (301) 903-1225
E-MAIL: Francis.Thio@science.doe.gov

Communications related to the formal proposal should use "Program Announcement LAB 08-16" in the subject line.

SUPPLEMENTARY INFORMATION:

Descriptions of the Research Programs and the Applications Solicited under this Announcement.

The OFES and NNSA have agreed to coordinate their research activities in the field of HEDLP under a Joint Program. This coordination is aligned with the recommendations of the interagency Task Force on High Energy Density (HED) Physics to provide improved stewardship of the field of HEDLP, while maintaining the interdisciplinary nature of this area of science, by tying the basic scientific research to its roots in application [1]. An important objective of the Joint Program in HEDLP in the long term is to enable the broader scientific community to conduct research at the major NNSA HED facilities - e.g., the National Ignition Facility (NIF) at the Lawrence Livermore National Laboratory, the Z-pinch pulsed power accelerator at Sandia National Laboratory and the Omega laser at the Laboratory for Laser Energetics at the University of Rochester. However, extensive and comprehensive evaluation of concepts and proposed experiments are required to fully realize the scientific potential of these large-scale facilities and to capture the opportunities they afford. As a scientific path forward towards the use of these large-scale facilities, HEDLP conditions may be achieved at many small- or intermediate-scale facilities using pulsed power driven accelerators, lasers, or ion-beam compression techniques. The availability and use of experimental facilities to address the objectives of this program is discussed in Section 2. Another important objective of the Joint Program in HEDLP is to provide an avenue to explore the HED physics that underpins the scientific foundation for inertial fusion energy sciences.

Planning of the Joint Program by the two Offices has been guided by the reports of the National Task Force on High Energy Density Physics chaired by Davidson [2], the interagency Task Force on High Energy Density Physics chaired by Keane and Kovar [1], and the HEDLP Workshop at Argonne National Laboratory chaired by Rosner and Browne [3]. Following are two of the main themes that encompass the scientific challenges and opportunities of HEDLP. Proposed research efforts can include experimental, theoretical, and/or computational science. Proposals integrating experiments, theory, and simulation are encouraged.

(i) Advance HED science that enables fusion energy

Fusion power has potential as a limitless source of clean energy. HEDLP is the key scientific component necessary for realizing this goal. Emerging concepts in inertial fusion include fast ignition, shock ignition, magneto-inertial fusion and heavy ion fusion. An advanced understanding of the fundamentals of laser-plasma interaction, radiation- matter interaction, hydrodynamic and magnetohydrodynamic processes in HED plasmas, and equations of state of inertial fusion materials at relevant conditions is required for the successful development of these approaches. Novel approaches to inertial fusion energy sciences also include ion-driven fast ignition, plasma jets forming imploding liner, magnetic flux compression, compression of ion beams, general studies of high magnetic fields in dense plasmas, and new experimental diagnostics that can probe the fundamental properties of HEDLP. Research proposals are sought

for advancing the scientific knowledge base underpinning the various inertial fusion approaches and their drivers.

(ii) Creation, control, diagnosis and utilization of new HEDLP conditions

There are substantial unexplored challenges to understanding phenomena in unique HEDLP conditions, including: shock-dominated, radiation-dominated, relativistic, high- pressure conditions, novel magnetic regimes, kinetic non-linear, and other unique physical states. This would also include novel methods of attaining those unique conditions. Research proposals are solicited that include investigations of the fundamental properties and behavior of plasmas created under high energy density conditions. Research addressing these questions includes novel methods of attaining and diagnosing those unique conditions. Studies of HED conditions may be relevant to observed astrophysical phenomena. Laboratory astrophysics has been identified as a significant opportunity for new HEDLP studies. Research areas of investigations could include (but are not limited to) the development of scaling laws on compressible hydrodynamic mixing, strong shock phenomena, radiation flow, radiative shocks and jets, accretion disk dynamics, complex opacities, equations of state, and relativistic plasmas. It should also be recognized that the regime identified as "warm dense matter" is also a significant area of opportunity in HEDLP research. This state which is dense enough to display both "solid-like" and "plasma-like" properties should be considered as a potential topic for this solicitation.

The total amount of funds available for competition is expected to be approximately \$3,000,000 in FY 2009, subject to further appropriation of funds for FY 2009 by the Congress and other factors.

[1] Office of Science and Technology Policy (OSTP), Report of the Interagency Task Force on High Energy Density Physics (Chairs: C. Keane, D. Kovar, Executive Secretary: Y. C. F. Thio), National Science and Technology Council, Committee on Science, Interagency Working Group on the Physics of the Universe.

[2] Office of Science and Technology Policy (OSTP), Frontiers for Discovery in High Energy Density Physics, National Task Force on High Energy Density Physics (Chair: R. C. Davidson), July 20, 2004.

[3] R. Rosner and J. C. Browne, Summary of a Workshop on Opportunities for High Energy Density Laboratory Plasma Science, Argonne National Laboratory, May 23- 24, 2007.
[http://www.science.doe.gov/ofes/ProgramNews/Orbach-HEDLP-final_\(2\).pdf](http://www.science.doe.gov/ofes/ProgramNews/Orbach-HEDLP-final_(2).pdf)

Collaboration

Collaborative research projects involving more than one institution are encouraged. Proposals submitted from different institutions, which are directed at a common research activity, should clearly indicate they are part of a proposed collaboration and contain a brief description of the overall research project, and include Letters of Coordination from the collaborative partners. However, each Proposal must have a distinct scope of work and a qualified principal investigator, who is responsible for the research effort being performed at his or her institution.

Further information on preparation of collaborative Proposals may be accessed via the Internet at: <http://www.science.doe.gov/grants/Colab.html>.

Use of Experimental Facilities

An important objective of the OFES-NNSA HEDLP Joint Program is to support and grow the use of intermediate- and large-scale experimental facilities by the external scientific community at large. These include both National Laboratory-based and university-based HED science experimental facilities.

For applicants who propose investigations requiring the use of either laboratory- or university-based experimental facilities, the applicant must make arrangements with the appropriate laboratory or university. Potential applicants are responsible for contacting the specific laboratory or university to discuss any facility-related activities and utilization, including availability of beam-time and appropriate diagnostics, shot schedule, support for target fabrication, etc. Costs for using a university-based facility will either be the responsibility of the National Laboratory through a sub-contracting arrangement, or the university may submit a companion proposal through the companion financial assistance Joint Program HEDLP solicitation. A letter from either the facility manager or program manager indicating 1) the level of communication between the Principal Investigator (PI) and facility management, 2) the feasibility of the proposed use of the facility, and 3) arrangements pursued regarding facility availability for this project must be included with the Proposal. For some national user facilities, such as those operated by the Office of Basic Energy Sciences (BES), the applicant may need to compete in a separate user facility access solicitation. A description of BES national scientific user facilities can be found at <http://www.sc.doe.gov/bes/BESfacilities.htm>.

Budget requests supporting investigations at either laboratory- or university-based experimental facilities must include all incremental costs necessary to perform the proposed experiment above the facility's baseline operational budget.

Examples of HED science experimental facilities include:

Intermediate-scale facilities:

Jupiter Laser Facility (LLNL): <http://jlf.llnl.gov/>

Contact: Andrew Ng,

JLF Science Director (925-423-4429, ng1@llnl.gov, <http://jlf.llnl.gov/>)

Don Correll, ILSA Director (925-422-6784, correll1@llnl.gov, <http://ilsa.llnl.gov>)

Trident Laser Facility (LANL): <http://Trident.lanl.gov>

Principal Contact: David Montgomery: montgomery@lanl.gov
(505) 665-7994, 699-1070

Alternate contact: Randy Johnson: rpjohnson@lanl.gov
(505) 665-5089, 665-5575

Nevada Terawatt Facility (University of Nevada at Reno): <http://www.ntf.unr.edu/>
Contact: Joseph M. Kindel
Director
Email: jkindel@unr.edu
Phone: 775-682-9706

Petawatt Laser Facility (University of Texas at Austin):
http://www.ph.utexas.edu/~utlasers/texas_petawatt_files/texas_petawatt.htm
Contact: Todd Ditmire
Professor
The Texas Center for High Intensity Laser Science
Department of Physics
University of Texas
Mail Stop C1600
Austin, TX 78712
Phone: 512-471-3296
FAX: 512-471-8865
email: tditmire@physics.utexas.edu

Cobra Pulsed Power Facility (Cornell University): <http://www.plasmacenter.cornell.edu/>
Contact: David Hammer
Professor
Electrical and Computer Engineering
327 Rhodes Hall, Cornell University, Ithaca, NY 14853
Tel: 607-255-3916
Fax: 607-255-9072

Laboratory of Plasma Studies
439 Rhodes Hall, Cornell University, Ithaca, NY 14853
Admin. Office: 607-255-4275
Laboratory: 607-255-5162

Heavy Ion Beam Experimental Facility (LBNL): <http://hif.lbl.gov/VNLresearch.html>
Contact: Grant Logan
Director, Virtual National Laboratory for Heavy Ion Fusion Science
Lawrence Berkeley National Laboratory
1 Cyclotron Road
MS/47-112
Berkeley, CA 94720
Tel: (510) 486-7206
Email: BGLogan@lbl.gov

Large--scale facilities:

National Ignition Facility (LLNL): <https://lasers.llnl.gov/>
Contact: Rokaya Al-Ayat

Director, NIF User Support Office
National Ignition Facility and Photon Science Lawrence Livermore National Laboratory
L-580 Livermore, CA 94551
925-422-8467, alayat1@llnl.gov

Z Pulsed Power Accelerator (SNL): <http://zpinch.sandia.gov/>
Contact: John Porter, (505)845-7526

Omega Laser (Laboratory for Laser Energetics at the University of Rochester):
<http://www.lle.rochester.edu/>
Contact: John M. Soures
Manager, National Laser Users Facility
Laboratory for Laser Energetics
University of Rochester
250 East River Rd.
Rochester, NY 14623
(585)275-3866 (phone)
(585)275-5960 (FAX)
jsou@lle.rochester.edu

For the use of the Omega Laser Facility at the University of Rochester, a parallel solicitation for the National Laser User Facility (NLUF) is planned to request access. A link to this solicitation can be found on Grants.gov. A link will also be posted at <http://www.lle.rochester.edu>.

Other facilities of relevance to the solicitation include:
Los Alamos Neutron Science Center (LANL): <http://lansce.lanl.gov/> (Proton Radiography, Weapons Nuclear Research, and Lujan Neutron Scattering Center) Contacts: Kurt Schoenberg, kurts@lanl.gov, 505 667 5051 Leilani Conradson, leilani@lanl.gov, 505 665 9505, lansce_users@lanl.gov

Shiva Star Pulsed Power Facility
Air Force Research Laboratory, Kirtland AFB, Albuquerque, NM
Contact: James Degnan, (505) 846-1235, james.degnan@kirtland.af.mil
Principal Physicist and Team Leader of the High Current Pulsed Power Team, AFRL/RDHP

NIKE Laser Facility
Naval Research Laboratory
Contact: Victor Serlin
Naval Research Laboratory, Code 6731,
4555 Overlook Ave, S.W., Washington DC 20375
tel. (202) 767-0678, fax (202) 767-0046
Email: serlin@this.nrl.navy.mil

Program Funding:

Research awards (typically single-investigator projects) are expected to be made for a period of one to three years at a funding level appropriate for the proposed scopes, with out-year support contingent on the availability of funds and satisfactory progress, though proposals may request support for up to five years. Consideration will also be given to multi-institution consortia proposing investigations in advancing the state-of-the-art in the technical themes identified in the section on Research Topics of this solicitation and, as appropriate, culminating in the use of large-scale HEDP facilities (such as NIF, Z, and Omega), or intermediate-scale facilities.

OFES reserves the right not to make any awards if no proposal is judged to be of suitable scientific quality or of sufficient relevance to the programs described in the section on Research Topics. The cost-effectiveness of the proposal will be considered when comparing proposals with differing funding requirements. Previous awards have ranged from approximately \$50,000 to \$1,000,000 per year in similar areas, typically less than \$500,000 per year. A single award or multiple awards may be made depending on the number and quality of the proposals received and favorably reviewed. If multiple awards are made, it is anticipated that award sizes may range from \$25,000 to \$1,000,000 per year, typically less than \$500,000 per year.

Additional Information

In selecting proposals for funding, priority will be given to proposals that can produce experimental results within three to four years after grant initiation. Theoretical research will be accepted for consideration under this Notice when bundled with and in support of an experimental Proposal. Preferred proposals in this category would typically have a performance period of, but not limited to, three or four years.

Proposals concerned with scientific assessment, theoretically and/or computationally, of new concepts or approaches that are not ready for experimental investigation should have a well-defined scope. The product of such assessment would be a clear scientific description of the concept and its operation, its physics and engineering basis, critical analysis of major difficulties to be overcome in developing the concept, and an analysis of what would be achieved by moving to experimental research. Proposals in this category should propose research with a performance period of, but not limited to, one or two years. Proposals in this category with a funding request between \$25,000 and \$50,000 are particularly welcome.

Formal Proposals:

DOE will accept new and renewal proposals under this Announcement. Renewal proposals compete with all other proposals. In preparing a renewal proposal, principal investigators should assume that reviewers will not have access to previous proposals. The proposal should be developed as fully as though the principal investigator were applying for the first time. The proposal must include all the information required for a new project, plus the project narrative section should discuss the results from prior work.

Funding under this Announcement is limited to supporting research activities based in the U.S. Collaborations with non-U.S. institutions are allowed provided the lead institution is a U.S. institution. Proposals from non-U.S. institutions will be declined.

The research project description must be **30 pages** or less, exclusive of attachments and appendices and must contain an abstract or summary of the proposed research. All collaborators should be listed with the abstract or summary. Attachments include literature cited, biographical sketches, description of facilities and resources, letters of endorsement, and a listing of all current and pending federal support. Biographical sketches should be limited to no more than two pages per individual. No Protected Personal Information should be included in the proposal. Protected Personal Information includes social security number, date of birth, mother's maiden name, driver license number and passport number.

The instructions and format described below should be followed. You must reference Program Announcement LAB 08-16 on all submissions and inquiries about this program.

**OFFICE OF SCIENCE
GUIDE FOR PREPARATION OF SCIENTIFIC/TECHNICAL PROPOSALS
TO BE SUBMITTED BY NATIONAL LABORATORIES**

Proposals from National Laboratories submitted to the Office of Science (SC) as a result of this Program Announcement will follow the Department of Energy Field Work Proposal process with additional information requested to allow for scientific/technical merit review. The following guidelines for content and format are intended to facilitate an understanding of the requirements necessary for SC to conduct a merit review of a proposal. Please follow the guidelines carefully, as deviations could be cause for declination of a proposal without merit review.

1. Evaluation Criteria

After an initial screening for eligibility and responsiveness to the solicitation, proposals will be subjected to scientific merit review (peer review). The proposals will be evaluated against the following criteria, which are listed in descending order of importance as set forth in 10 CFR Part 605.10 (d). Included with each criteria are the detailed questions that will be asked of the reviewers.

Scientific and/or Technical Merit of the Proposed Research

- Discuss and assess the importance of the research being proposed in the relevant field of science (one or more of the research areas (i) - (vi) identified in the section on Research Topics.
- Does the proposal clearly identify the scientific objectives and/or the scientific issues of the proposed research? Comment on the significance of the scientific objectives and/or the issues identified.
- What is the likelihood that it will lead to new or fundamental advances in its field? Comment on the potential impact of the expected findings on the development in its field (one or more of the research areas (i) - (vi) identified in the section on Research Topics.

Appropriateness of the Proposed Method or Approach

- Are the conceptual framework, proposed methods, and analyses sound and adequately developed and likely to lead to scientifically valid conclusions?
- To what extent does the proposer recognize significant potential problems and consider alternative strategies?
- Comment on the effectiveness of the proposed research efforts in addressing the scientific issues and/or objectives of the proposed research.

Competency of Applicant's Personnel and Adequacy of Proposed Resources

- How well qualified are the proposer's personnel to carry out the proposed research? (If appropriate, please comment on the scientific reputation and quality of recent research by the principal investigators and other key personnel.)
- Please comment on the proposer's research environment and resources.
- Does the proposed work take advantage of unique facilities and capabilities and/or make good use of collaborative arrangements?

Reasonableness and Appropriateness of the Proposed Budget

- Is the proposed budget and staffing levels adequate to carry out the proposed research?

Performance under the Existing Award

- Assess the progress the proposers made toward the research goals during the most recent performance period (last funding cycle) and the impact of the research in the relevant area of science.
- Have the proposers disseminated the results of their research through publications in peer-reviewed journals, meeting and conference presentations, workshops, or other appropriate means?
- If appropriate, have the proposers attempted to compare experimental results against theoretical predictions?

Other Appropriate Factors

- Could the proposed research make a significant contribution to another field?
- Is there potential for spin-offs?
- If applicable, please comment on the educational benefits of the proposed activity.

The OFES will also consider, as part of the evaluation, other available advice or information as well as program policy factors such as ensuring an appropriate balance among the program areas and within the program areas, coupling to the theory and computational efforts, and quality of previous performance. Selection of proposals for award will be based upon the findings of the technical evaluations, the importance and relevance of the proposed research to the OFES missions in high energy density laboratory plasmas, and funding availability. Funding under this Notice is limited to supporting research activities based in the U.S., though subcontracts with limited funding for collaborators outside the U.S. may be allowed with appropriate justifications.

2. Summary of Proposal Contents

- Field Work Proposal (FWP) Format (Reference DOE Order 412.1A) (DOE ONLY)
- Proposal Cover Page
- Table of Contents
- Budget (DOE Form 4620.1) and Budget Explanation
- Abstract (one page)
- Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel)
- Literature Cited
- Biographical Sketch(es)
- Description of Facilities and Resources
- Other Support of Investigator(s)
- Appendix (optional)

2.1 Number of Copies to Submit

A complete formal FWP in a single Portable Document Format (PDF) document that has 'formatted text and graphics' (also known as "native" PDF) must be submitted using the **Office of Science Field Work Proposal Instructions** provided in the Notice to Users section on the Searchable FWP home page: <http://www.osti.gov/fwp>. (This submission process includes sending the FWP via CD using Federal Express).

Send CD via Federal Express to:

Mr. John Sauter
U.S. Department of Energy
Office of Fusion Energy Sciences, SC-24.2/GTN
19901 Germantown Road
Germantown, MD 20874-1290
ATTN: Program Announcement LAB 08-16

To identify that the FWP is responding to this Program Announcement, when sending your CD please identify the Program Announcement Title and Program Announcement number on the Federal Express package.

In addition to following the submission instructions on the <http://www.osti.gov/fwp> web site, please submit via email, a single PDF file of the entire LAB proposal and FWP. This will assist in expediting the review process. Please send the email to: john.sauter@science.doe.gov. Please include "Proposal for LAB 08-16" in the subject line of the email.

3. Detailed Contents of the Proposal

Adherence to type size and line spacing requirements is necessary for several reasons. No researcher should have the advantage, by using small type, of providing more text in their

proposals. Small type may also make it difficult for reviewers to read the proposal. Proposals must have 1-inch margins at the top, bottom, and on each side. Type sizes must be at least 11 point. Line spacing is at the discretion of the researcher, but there must be no more than 6 lines per vertical inch of text. Pages should be standard 8 1/2" x 11" (or metric A4, i.e., 210 mm x 297 mm).

3.1 Field Work Proposal Format (Reference DOE Order 412.1A) (DOE ONLY)

The Field Work Proposal (FWP) is to be prepared and submitted consistent with policies of the investigator's laboratory and the local DOE Operations Office. Additional information is also requested to allow for scientific/technical merit review. Laboratories may submit proposals directly to the SC Program office listed above. A copy should also be provided to the appropriate DOE operations office.

3.2 Proposal Cover Page

The following proposal cover page information may be placed on plain paper. No form is required.

Title of proposed project

SC Program announcement title

Research area(s): (One or more of the Research Topics (i)-(vi))

Name of laboratory

Name of principal investigator (PI)

Position title of PI

Mailing address of PI

Telephone of PI

Fax number of PI

Electronic mail address of PI

Name of official signing for laboratory*

Title of official

Fax number of official

Telephone of official

Electronic mail address of official

Requested funding for each year; total request

Use of human subjects in proposed project:

If activities involving human subjects are not planned at any time during the proposed project period, state "No"; otherwise state "Yes", provide the IRB Approval date and Assurance of Compliance Number and include all necessary information with the proposal should human subjects be involved.

Use of vertebrate animals in proposed project:

If activities involving vertebrate animals are not planned at any time during this project, state "No"; otherwise state "Yes" and provide the IACUC Approval date and Animal Welfare Assurance number from NIH and include all necessary information with the proposal.

Signature of PI, date of signature
Signature of official, date of signature*

*The signature certifies that personnel and facilities are available as stated in the proposal, if the project is funded.

3.3 Table of Contents

Provide the initial page number for each of the sections of the proposal. Number pages consecutively at the bottom of each page throughout the proposal. Start each major section at the top of a new page. Do not use unnumbered pages and do not use suffices, such as 5a, 5b.

3.4 Budget and Budget Explanation

A detailed budget is required for the entire project period and for each fiscal year. It is preferred that DOE's budget page, Form 4620.1 be used for providing budget information*. Modifications of categories are permissible to comply with institutional practices, for example with regard to overhead costs.

A written justification of each budget item is to follow the budget pages. For personnel this should take the form of a one-sentence statement of the role of the person in the project. Provide a detailed justification of the need for each item of permanent equipment. Explain each of the other direct costs in sufficient detail for reviewers to be able to judge the appropriateness of the amount requested.

Further instructions regarding the budget are given in section 4 of this guide.

* Form 4620.1 is available at web site: <http://www.science.doe.gov/grants/budgetform.pdf>

3.5 Abstract

Summarize the proposal in no more than two pages. Give the project objectives (in broad scientific terms), the approach to be used, and what the research is intended to accomplish. State the hypotheses to be tested (if any). At the top of the abstract give the project title, names of all the investigators and their institutions, and contact information for the principal investigator, including e-mail address.

3.6 Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel).

The narrative comprises the research plan for the project and is **limited to 30 pages** (maximum), including text and figures, when printed using standard 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right) and font not smaller than 11 point. It should contain enough background material in the Introduction, including review of the relevant literature, to demonstrate sufficient knowledge of the state of the science. The major part of the narrative

should be devoted to a description and justification of the proposed project, including details of the methods to be used. It should also include a timeline for the major activities of the proposed project, and should indicate which project personnel will be responsible for which activities. In addition to the technical description of the proposed work and tasks, include a discussion of the following: plans for comparison between theoretical predictions and experimental measurements where appropriate; plans for verification and validation of computer codes where appropriate; impact of the proposed research on other fields of science, if appropriate; project schedules, milestones, and deliverables. It is important that the 30-page technical information section provide a complete description of the proposed work, because reviewers are not obliged to read the Appendices. Proposals exceeding these page limits may be rejected without review. If any portion of the project is to be done in **collaboration** with another institution (or institutions), provide information on the institution(s) and what part(s) of the project it will carry out. Further information on any such arrangements is to be given in the sections "Budget and Budget Explanation," "Biographical Sketches," and "Description of Facilities and Resources." Collaborative research projects with institutions that receive grants, such as universities, industry, and non-profit organizations, are **allowed** under this Announcement. See the section on Collaboration. Further information on collaboration may be accessed at <http://www.science.doe.gov/grants/Colab.html>.

3.7 Literature Cited

Give full bibliographic entries for each publication cited in the narrative. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. Include only bibliographic citations. Principal investigators should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the proposal.

3.8 Biographical Sketches

This information is required for senior personnel at the institution submitting the proposal and at all subcontracting institutions (if any). The biographical sketch is limited to a maximum of two pages for each investigator and must include:

Education and Training. Undergraduate, graduate and postdoctoral training, provide institution, major/area, degree and year.

Research and Professional Experience. Beginning with the current position list, in chronological order, professional/academic positions with a brief description.

Publications. Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights and software systems developed may be provided in addition to or substituted for publications.

Synergistic Activities. List no more than 5 professional and scholarly activities related to the effort proposed.

To assist in the identification of potential conflicts of interest or bias in the selection of reviewers, the following information must also be provided in each biographical sketch.

Collaborators and Co-editors: A list of all persons in alphabetical order (including their current organizational affiliations) who are currently, or who have been, collaborators or co-authors with the investigator on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of the proposal. Also, include those individuals who are currently or have been co-editors of a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of the proposal. If there are no collaborators or co-editors to report, this should be so indicated.

Graduate and Postdoctoral Advisors and Advisees: A list of the names of the individual's own graduate advisor(s) and principal postdoctoral sponsor(s), and their current organizational affiliations. A list of the names of the individual's graduate students and postdoctoral associates during the past five years, and their current organizational affiliations.

3.9 Description of Facilities and Resources

Facilities to be used for the conduct of the proposed research should be briefly described. Indicate the pertinent capabilities of the institution, including support facilities (such as machine shops), that will be used during the project. List the most important equipment items already available for the project and their pertinent capabilities. Include this information for each subcontracting institution (if any).

3.10 Other Support of Investigators

Other support is defined as all financial resources, whether Federal, non-Federal, commercial, or institutional, available in direct support of an individual's research endeavors. Information on active and pending other support is required for all senior personnel, including investigators at collaborating institutions to be funded by a subcontract. For each item of other support, give the organization or agency, inclusive dates of the project or proposed project, annual funding, and level of effort (months per year or percentage of the year) devoted to the project.

3.11 Appendix

Information not easily accessible to a reviewer may be included in an appendix, but do not use the appendix to circumvent the page limitations of the proposal. Reviewers are not required to consider information in an appendix, and reviewers may not have time to read extensive appendix materials with the same care they would use with the proposal proper.

The appendix may contain the following items: up to five publications, manuscripts accepted for publication, abstracts, patents, or other printed materials directly relevant to this project, but not generally available to the scientific community; and letters from investigators at other institutions stating their agreement to participate in the project (do not include letters of endorsement of the project).

4. Detailed Instructions for the Budget

(DOE Form 4620.1 "Budget Page" may be used).

4.1 Salaries and Wages

List the names of the principal investigator and other key personnel and the estimated number of person-months for which DOE funding is requested. Proposers should list the number of postdoctoral associates and other professional positions included in the proposal and indicate the number of full-time-equivalent (FTE) person-months and rate of pay (hourly, monthly or annually). For graduate and undergraduate students and all other personnel categories such as secretarial, clerical, technical, etc., show the total number of people needed in each job title and total salaries needed. Salaries requested must be consistent with the institution's regular practices. The budget explanation should define concisely the role of each position in the overall project.

4.2 Equipment

DOE defines equipment as "an item of tangible personal property that has a useful life of more than two years and an acquisition cost of \$25,000 or more." Special purpose equipment means equipment which is used only for research, scientific or other technical activities. Items of needed equipment should be individually listed by description and estimated cost, including tax, and adequately justified. Allowable items ordinarily will be limited to scientific equipment that is not already available for the conduct of the work. General purpose office equipment normally will not be considered eligible for support.

4.3 Domestic Travel

The type and extent of travel and its relation to the research should be specified. Funds may be requested for attendance at meetings and conferences, other travel associated with the work and subsistence. In order to qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results. Consultant's travel costs also may be requested.

4.4 Foreign Travel

Foreign travel is any travel outside Canada and the United States and its territories and possessions. Foreign travel may be approved only if it is directly related to project objectives.

4.5 Other Direct Costs

The budget should itemize other anticipated direct costs not included under the headings above, including materials and supplies, publication costs, computer services, and consultant services (which are discussed below). Other examples are: aircraft rental, space rental at research establishments away from the institution, minor building alterations, service charges, and fabrication of equipment or systems not available off-the-shelf. Reference books and periodicals may be charged to the project only if they are specifically related to the research.

a. Materials and Supplies

The budget should indicate in general terms the type of required expendable materials and supplies with their estimated costs. The breakdown should be more detailed when the cost is substantial.

b. Publication Costs/Page Charges

The budget may request funds for the costs of preparing and publishing the results of research, including costs of reports, reprints page charges, or other journal costs (except costs for prior or early publication), and necessary illustrations.

c. Consultant Services

Anticipated consultant services should be justified and information furnished on each individual's expertise, primary organizational affiliation, daily compensation rate and number of days expected service. Consultant's travel costs should be listed separately under travel in the budget.

d. Computer Services

The cost of computer services, including computer-based retrieval of scientific and technical information, may be requested. A justification based on the established computer service rates should be included.

e. Subcontracts

Subcontracts should be listed so that they can be properly evaluated. There should be an anticipated cost and an explanation of that cost for each subcontract. The total amount of each subcontract should also appear as a budget item.

4.6 Indirect Costs

Explain the basis for each overhead and indirect cost. Include the current rates.